

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 1865wo-ag	FOR FURTHER ACTION		See Form PCT/PEA/416
International application No. PCT/FI2005/050054	International filing date (<i>day/month/year</i>) 01.03.2005	Priority date (<i>day/month/year</i>) 10.03.2004	
International Patent Classification (IPC) or national classification and IPC INV. B65D90/02			
Applicant AKER FINNYARDS OY et al.			
<ol style="list-style-type: none"> 1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36. 2. This REPORT consists of a total of 5 sheets, including this cover sheet. 3. This report is also accompanied by ANNEXES, comprising: <ol style="list-style-type: none"> a. <input checked="" type="checkbox"/> <i>sent to the applicant and to the International Bureau</i> a total of 3 sheets, as follows: <ul style="list-style-type: none"> <input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions). <input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box. b. <input type="checkbox"/> (<i>sent to the International Bureau only</i>) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in electronic form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions). 			
<ol style="list-style-type: none"> 4. This report contains indications relating to the following items: <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Box No. I Basis of the report <input type="checkbox"/> Box No. II Priority <input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability <input type="checkbox"/> Box No. IV Lack of unity of invention <input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement <input type="checkbox"/> Box No. VI Certain documents cited <input type="checkbox"/> Box No. VII Certain defects in the international application <input type="checkbox"/> Box No. VIII Certain observations on the international application 			
Date of submission of the demand 04.01.2006		Date of completion of this report 14.06.2006	
Name and mailing address of the international preliminary examining authority: <div style="display: flex; align-items: center;"> <div> European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465 </div> </div>		Authorized officer Piolat, O Telephone No. +49 89 2399-2969	



**INTERNATIONAL PRELIMINARY REPORT
ON PATENTABILITY**

International application No.
PCT/FI2005/050054

Box No. I Basis of the report

1. With regard to the **language**, this report is based on
- ☒ the international application in the language in which it was filed
 - ☐ a translation of the international application into , which is the language of a translation furnished for the purposes of:
 - ☐ international search (under Rules 12.3(a) and 23.1(b))
 - ☐ publication of the international application (under Rule 12.4(a))
 - ☐ international preliminary examination (under Rules 55.2(a) and/or 55.3(a))
2. With regard to the **elements*** of the international application, this report is based on (*replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report*):

Description, Pages

1-5 as originally filed

Claims, Numbers

1-13 filed with the demand

Drawings, Sheets

1/4-4/4 as originally filed

- ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing
3. ☐ The amendments have resulted in the cancellation of:
- ☐ the description, pages
 - ☐ the claims, Nos.
 - ☐ the drawings, sheets/figs
 - ☐ the sequence listing (*specify*):
 - ☐ any table(s) related to sequence listing (*specify*):
4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
- ☐ the description, pages
 - ☐ the claims, Nos.
 - ☐ the drawings, sheets/figs
 - ☐ the sequence listing (*specify*):
 - ☐ any table(s) related to sequence listing (*specify*):

* If item 4 applies, some or all of these sheets may be marked "superseded."

**INTERNATIONAL PRELIMINARY REPORT
ON PATENTABILITY**

International application No.
PCT/FI2005/050054

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	1-13
	No: Claims	
Inventive step (IS)	Yes: Claims	1-13
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-13
	No: Claims	

2. Citations and explanations (Rule 70.7):

see separate sheet

Re Item V

**Reasoned statement with regard to novelty, inventive step or industrial applicability;
citations and explanations supporting such statement**

- 1 Reference is made to the following document:
D1: US-A-3 246 789 (PROGLER HANS) 19 April 1966 (1966-04-19)
- 2 The document D1 is regarded as being the closest prior art to the subject-matter of claim 1, and shows (see column 2, lines 37-57; column 3, lines 30-44; fig.1-3) a method of manufacturing a tank suitable for storing very cold cryogenic liquids, such as liquefied ethylene (LEG) or natural gas (LNG) or a corresponding medium, the basic form of the tank corresponding to a rectangular prism and being manufactured from aluminium or the like material, whereby the tank is produced at least mainly from prefabricated structure elements of few different types so that plane elements meant as shell elements are produced by mechanically extruding profile elements (2) including a plane part and a stiffening part and which are welded to each other by their plane parts, and the plane elements produced thus are provided with longitudinal and/or transverse stiffeners (8, 9) produced by mechanically extruding profile elements which are welded to each other and that the plane elements having stiffeners are attached to each other and/or to separately produced edge and/or corner elements into self-supporting volume units having at least four sides.

The subject-matter of claim 1 therefore differs from this known method in that:

- a) the stiffening parts extend essentially perpendicular to the plane parts and have a free distal end relative to the plane parts;
- b) the stiffeners extend only partly through the internal space of the volume units between opposite sides thereof; and
- c) the different elements are welded to each other using friction welding.

The subject-matter of claim 1 is therefore new (Article 33(2) PCT).

The problem to be solved by the present invention may be regarded as to provide a method of manufacturing a tank of reduced weight and uncomplicated structure but still of sufficient strength.

Neither D1 nor the other documents cited in the Search Report disclose or suggest the distinguishing features defined in claim 1, and thus, the solution to the aforementioned problem proposed in claim 1 of the present application is considered as involving an inventive step (Article 33(3) PCT)

- 3 The expression "or the like" used in the characterising portion of independent claim 9 renders the profile elements of the plane elements and of the stiffeners optional. However, these profile elements are to be considered as essential to the definition of the invention in view of the problem to be solved, and thus, independent claim 9, not containing these features, does not meet the requirement following from Article 6 PCT taken in combination with Rule 6.3(b) PCT that any independent claim must contain all the technical features essential to the definition of the invention.

A clarified independent claim 9 would contain the same inventive concept as that defined in claim 1, and thus, a clarified claim 9 would also meet the requirements of the PCT with respect to novelty and inventive step.

- 4 Claims 2-8 and 10-13 are dependent on claim 1 respectively claim 9 and as such also meets the requirements of the PCT with respect to novelty and inventive step.
- 5 Although independent claim 9 is drafted in the two-part form some features are incorrectly placed in the characterising portion, as they are disclosed in document D1 in combination with the features placed in the preamble (Rule 6.3(b) PCT).
- 6 Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the document D1 is not mentioned in the description, nor is this document identified therein.
- 7 The description is not in conformity with the claims as required by Rule 5.1(a)(iii) PCT.

AMENDED CLAIMS

1. A method of manufacturing a tank suitable for storing very cold cryogenic liquids, such as liquefied ethylene (LEG) or natural gas (LNG) or a corresponding medium, the basic form of the tank corresponding to a rectangular prism and being manufactured from aluminium or the like material, characterized in that the tank is produced at least mainly from prefabricated structure elements of few different types so that plane elements (2) meant as shell elements are produced by mechanically extruding profile elements (1) including a plane part (1a) and a stiffening part (1b) the stiffening part (1b) extending essentially perpendicular to the plane part (1a) and having a free distal end relative to the plane part (1a), and the profile elements (1) are welded to each other by their plane parts (1a) by using friction welding, and the plane elements (2) hereby produced are provided with longitudinal and/or transverse stiffeners (4) produced by mechanically extruding profile elements (3) which are welded to each other by using friction welding, and that the plane elements (2) having stiffeners (4) are attached to each other and/or to separately produced edge (5) and/or corner elements (6) into self-supporting volume units (7) having at least four sides, the said stiffeners (4) extending only partly through the internal space of said volume units (7) between the opposite sides thereof.

2. A method according to claim 1, characterized in that in order to form a tank of the desired size one or more volume units (7) are chosen, the volume units being arranged one after the other and connected to each other.

3. A method according to claim 1 or 2, characterized in that the prefabricated structure elements are precisely machined to the predetermined dimension and that the ends of the plane elements and the profiles are bevelled for producing a correct and precise welding groove, most preferably by machining with a shape cutter.

4. A method according to any of the preceding claims, **characterized** in that the extruded profile elements (1) of the plane elements (2) are made symmetrical in relation to the normal plane of the plane part (1a) and that their stiffener part (1b) is T- or I-shaped in cross-section.

5. A method according to any of the preceding claims, **characterized** in that the dimensions of the profile element (1) in the cross-section plane are varied according to the planned location of the plane element (2) in the ready tank.

6. A method according to any of the preceding claims, **characterized** in that the edge (5) and corner elements (6) are made from rolled plate bent to the shape and dimensions of the desired radius.

7. A method according to any of the preceding claims, **characterized** in that when attaching the volume units (7) to each other a splash bulkhead (8) produced from extruded profile by using friction welding is installed between them, the splash bulkhead (8) comprising a number of openings (10) connecting the adjacent volume units (7).

8. A method according to any of the preceding claims, **characterized** in that the plane element (2) used in the shell construction and splash bulkheads (8) of the volume unit (7) is dimensioned so that it is typically about 16 x 16 metres.

9. An aluminium tank or the like, suitable for storing LNG or the like medium to be stored in very low temperatures, the basic form of the tank corresponding to a rectangular prism, **characterized** in that the tank is produced at least mainly from prefabricated construction elements of few different types, the elements including plane elements (2) to be used as shell panels of the tank, the plane elements (2) being produced of mechanically extruded aluminium profile elements (1) or the like, the profile elements (1) including a plane part and (1a) and a stiffening part (1b), the

stiffening part (1b) extending essentially perpendicular to the plane part (1a) and having a free distal end relative to the plane part (1a), and the profile elements (1) being welded by their plane parts (1a) to each other by means of friction welding to produce the plane elements (2), and the plane elements (2) being provided with longitudinal and/or transverse stiffeners (4) being produced of mechanically extruded aluminium profile elements (3) or the like welded to each other by means of friction welding, and the plane elements (2) having stiffeners (4) being attached to each other and/or to separately produced edge (5) and/or corner elements (6) into self-supporting volume units (7) having at least four sides, the said stiffeners (4) extending only partly through the internal space of said volume units (7) between the opposite sides thereof.

10. A tank according to claim 9, characterized in that in order to form a tank of the desired size one or more volume units (7) are arranged one after the other and connected to each other.

11. A tank according to claim 9 or 10, characterized in that the tank is formed from a number of prefabricated, self-supporting volume units (7) arranged one after the other, the volume units (7) being separated from each other by a splash bulkhead (8).

12. A tank according to any of claims 9 - 11, characterized in that the tank is provided with means known as such, such as a tube tower (9), for filling and emptying the tank.

13. A tank according to any of claims 9 - 11, characterized in that the extruded profile elements (1) of the plane elements (2) are symmetrical in cross-section in relation to the normal plane of the plane part (1a) and that their stiffening part (1b) is T- or I-shaped in cross-section.